UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,899	07/09/2003	Seong Soo Jang	CU-3282 RJS	9848

26530 7590 07/31/2007

LADAS & PARRY LLP
224 SOUTH MICHIGAN AVENUE
SUITE 1600
CHICAGO, IL 60604

EXAMINER	
KORNAKOV, MIKHAIL	
ART UNIT	**PAPER NUMBER**
1746	
MAIL DATE	**DELIVERY MODE**
07/31/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/615,899	JANG ET AL.	
	Examiner	Art Unit	
	Michael Kornakov	1746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,11 and 12* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,11,12* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/29/2007 has been entered.

2. Claims 1, 11, 12 are examined on the merits.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 1, 11, 12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 recites "generating a **first** plasma...that consists essentially of hydrogen and 5% to 90% argon; and **after the first plasma is generated, generating a second plasma**...consisting essentially of nitrogen and 5% to 90% argon" .

Claim 11 recites "generating a **first** plasma...that consists essentially of nitrogen...; and **after the first plasma is generated, generating a second plasma**...that consists essentially of hydrogen...".

However, the instant disclosure does not provide for the sequence of steps as claimed.

On page 6 the instant disclosure states, that "In a first process, after the hydrogen-based plasma (containing argon, if necessary) is generated in the etching or deposition apparatus using chloride series gas, the following etching or deposition is performed.

In a second process, after the nitrogen-based plasma (containing hydrogen and argon, if necessary) is generated in the etching or deposition apparatus using chloride series gas, the following etching or deposition is performed."

As understood, the instant disclosure provides for the step wherein a hydrogen based plasma is generated followed by etching or deposition, or for the step wherein the nitrogen based plasma is generated following by etching or deposition. The process requiring sequential steps as per claim 1 or claim 11 is not located in the instant disclosure and therefore the recitations of claims 1 and 11 represent new maters.

Claim 12 recites "a second plasma...that includes nitrogen and a combination of 5% to **90%** hydrogen and 5% to 90% argon". Such plasma is not described by the instant specification, thus representing a new matter.

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fitzsimmons et al (U.S. 6,626,188) in view of Rossman (U.S. 6,843,858).

Fitzsimmons teaches cleaning, thus improving reliability, of the plasma CVD chamber, wherein the chamber was previously treated with fluorine containing gas. The method of Fitzsimmons comprises treating the chamber with a first plasma generated from hydrogen and treating the chamber with a second plasma generated from the mixture of hydrogen and nitrogen (col. 6, lines 33-55).

The teaching of Fitzsimmons provides the processing steps similar to those instantly claimed, however remains silent about treating the chamber upon processing wherein chlorine containing gas was used. It is noted that chlorine and fluorine belong to the same group of halogens, thus possessing similar properties. Therefore, one skilled in the art would have found obvious to clean the chamber previously subjected to processing with chlorine containing gas and having chlorine containing residues accumulated on inner surfaces utilizing the method of Fitzsimmons with the reasonable expectation of success.

With regard to particular content of hydrogen in the second plasma, it is noted that this parameter is result effective since hydrogen chemically reacts with halogen and therefore the content of hydrogen depends on the amount of halogen to be removed. The instant disclosure does not provide any criticality regarding the amount of hydrogen in the second plasma and therefore it is ordinarily within the skill in the art to optimize

the value of result effective variable in known process, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

The teaching of Fitzsimmons also remains silent about the presence/content of argon in the first and second plasmas. However, argon is conventionally utilized in the art of plasma processing in order to assist in plasma cleaning, stabilize and sustain plasmas, etc. Thus, Rossman teaches a method of plasma cleaning a CVD chamber wherein argon is used in combination with hydrogen in order to intentionally sputter the contaminated chamber surfaces, thus enhancing the chamber cleaning (paragraph bridging co. 8 and 9; col. 9, lines 34-37). Therefore, one skilled in the art motivated by Rossman would have found obvious to include argon in appropriate amount while generating the first and the second plasmas in order to stabilize and sustain plasmas and at the same time to enhance chamber cleaning in the method of Fitzsimmons.

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over JP2000-234174.

JP'174 teaches removal chlorine containing residues from the CVD processing chamber under plasma discharge conditions by nitriding the chlorine containing residues adhered to chamber surfaces with nitrogen, thus, releasing chlorine species and removing chlorine species in the form of HCl by reaction with hydrogen (0030-0032). While indicating the possible use of a mixture of nitrogen and hydrogen for chamber processing, JP'174 specifically teaches that the amount of nitrogen within the mixture should be as much as possible (0031), thus providing the motivation to separate

nitrogen treatment from hydrogen treatment during the chamber processing. Since the instant disclosure does not provide any criticality of using separate plasmas of nitrogen and hydrogen for chamber processing, but teaches that the claimed process **may be** applied in certain sequences, since sequential or simultaneous generation of plasma from nitrogen and hydrogen produces the same plasma species and since JP'174 specifically teaches that the amount of nitrogen within the mixture should be as much as possible, one skilled in the art would have found obvious to clean the chamber by generating a first plasma from nitrogen for full nitriding of residues, followed by the plasma from hydrogen for complete removal of chlorine species in lieu of simultaneous application of plasma as per teaching of JP'174 while removing chlorine containing residues from CVD processing chamber with the reasonable expectation of success.

8. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rossman (U.S. 6,843,858) in view of Shrotriya (U.S. 6,068,729) and in further view of JP07-297130.

Rossman teaches a method of plasma cleaning a CVD chamber having accumulated fluorine containing residue (aluminum fluoride). The method of Rossman comprises treating the chamber with plasma that includes hydrogen and argon (paragraph bridging co. 8 and 9; col. 9, lines 34-37).

Rossman remains silent about the step of treating the chamber with the plasma consisting essentially of nitrogen and argon. However, Rossman teaches that the other gases can be considered depending on the type of residue that accumulates and

remains within the chamber (col.4, lines 5-8). Shrotriya teaches two step process for cleaning plasma processing chamber having accumulated fluorine containing residue (aluminum fluoride). Shrotriya specifically indicates that in order to completely remove aluminum fluoride and passivate the processing chamber interior surfaces, thus reducing the formation of residues, the chamber is finally treated with plasma of nitrogen (col.4, lines 10-22; paragraph, bridging col.11 and 12; col. 12, lines 62-64).

Therefore, since both Rossma and Shrotriya are concerned with removal of the same fluorine containing residue from the processing chamber, since Shrotriya provides clear motivation to utilize plasma of nitrogen for the final cleaning step, one skilled in the art motivated by Shrotriya would have found obvious to generate and apply plasma of nitrogen upon cleaning the chamber with hydrogen/argon in order to passivate the processing chamber interior surfaces thus reducing formation of residues on inner surfaces while cleaning the chamber as per teaching of Rossman.

The teaching of Rossman/ Shrotriya remains silent about treating the chamber upon processing wherein chlorine containing gas was used. It is noted that chlorine and fluorine belong to the same group of halogens, thus possessing similar properties. Therefore, one skilled in the art would have found obvious to clean the chamber previously subjected to processing with chlorine containing gas and having chlorine containing accumulated residues utilizing the method of Rossman/ Shrotriya with the reasonable expectation of success.

The teaching of Rossman/ Shrotriya also remains silent about the presence and content of argon in the plasma of nitrogen. However, argon is conventionally utilized in

the art of plasma processing in order to assist in plasma cleaning, stabilize and sustain plasmas, prevent nitrogen plasma species from recombining, etc. The use of argon in combination with nitrogen for plasma processing is indicated for example by JP07-297130. Therefore, it would be obvious to introduce argon into the nitrogen plasma in order to stabilize and sustain nitrogen plasma while enhancing processing the chamber as per teaching of Rossman/ Shrotriya. Regarding content of argon in plasmas, as instantly claimed, it is noted that the criticality of this parameter is not shown by Applicants. Therefore, since the amount of argon affects the chamber processing by stabilizing the plasma of nitrogen, by sputtering the contaminated chamber surfaces, by producing excessive heat within the chamber, etc. it is ordinarily within the skill in the art to optimize the value of result effective variable in known process, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

9. Applicants' attention is drawn to the fact that the instant claims are directed to three distinct inventions represented by claims 1, 11, 12, since each claim recites the use of materially different plasma for chamber processing. The restriction requirement is not made at this time, however it may be imposed later if the claims are amended to introduce additional limitations to each invention, which would require an additional search in each invention.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M. Kornakov

Michael Kornakov
Primary Examiner
Art Unit 1746

07/26/2007